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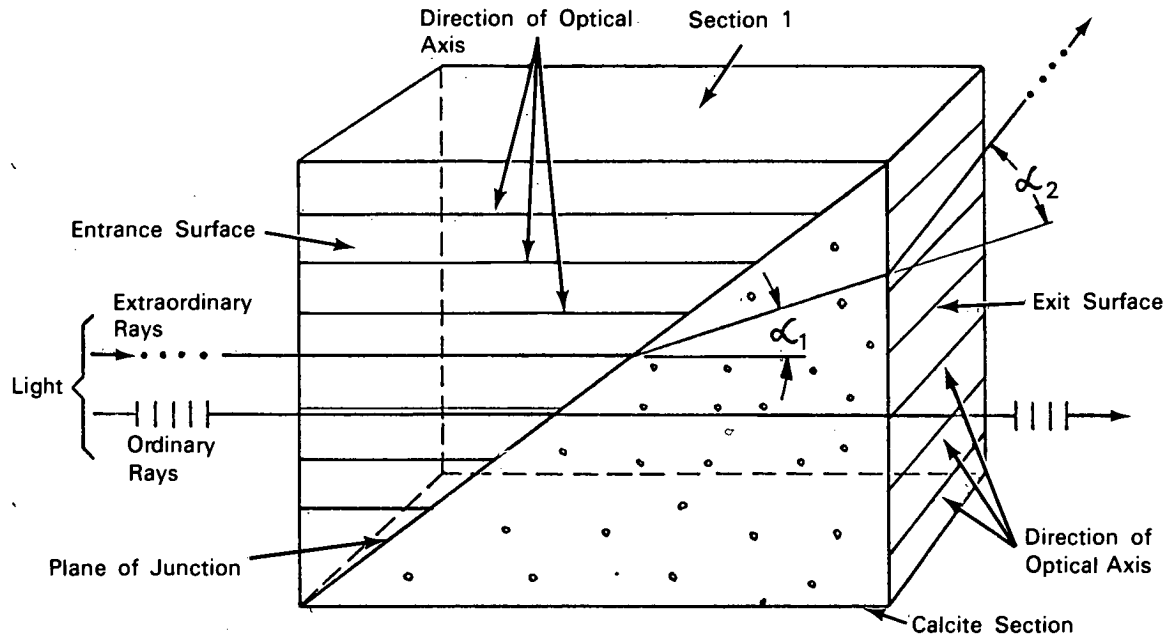
Less-Expensive Rochon Prisms



Rochon Prism; Diagrammatic

In an all-calcite ($CaCO_3$) Rochon prism, the half that is difficult to polish can be replaced by an easily polishable isotropic medium such as glass. The glass section should be selected on the basis of its index of refraction; i.e., the index of refraction should match that of calcite for the oridinary ray (n = 1.655 at a wavelength of 0.643 μ). The prism will then transmit the ordinary ray and refract the extraordinary ray, making the angular separation between the two rays the same as that in a conventional all-calcite Rochon prism.

Thus the prism's content of calcite, a much more expensive material than glass, is reduced by 50%, and the reciprocal polarizing properties of a conventional Rochon prism are retained. Light traversing the prism in the direction opposite that shown in the figure is divided into ordinary and extraordinary rays at the plane of junction.

The efficiency of a Rochon prism depends largely on the smoothness of the incident light entrance surface and on the perpendicularity of the plane of that surface to the optical axis of section-1. Such a surface is difficult to grind and polish on calcite. Calcite's properties are such that it tends to fracture unevenly and to chip when ground in a plane perpendicular to the axis. Use of cloth polishers eliminates chipping but lowers the quality of the finished surface.

Quartz, as a substitute material, is easier to grind and polish than calcite, but it gives only slight separation

(continued overleaf)

of the ordinary and extraordinary rays. This is due to (1) the inherently small degree of birefringence in quartz and (2) the substantial optical activity and optical rotary dispersion experienced by light traversing a quartz prism.

The figure shows a Rochon prism of which section-1 is conventionally made of calcite but is now made of glass. Angle-α_1 is the angle of refraction of extraordinary rays at the plane of junction, caused by the change in their index of refraction from 1.655 in the glass to 1.485 in calcite. Angle α_2 is the angle of further refraction on the ray's emergence from the prism. The total deviation is the sum of angles α_1 and α_2.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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